

# STABILIZER CONTAINING PHOSPHORYLATED POLYSACCHARIDES AS ACTIVE INGREDIENT AND ITS UTILIZATION

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## Abstract of JP 8224060 (A)

PURPOSE: To obtain a stabilizer, containing phosphorylated polysaccharides produced by lactic acid bacteria as an active ingredient and useful for producing a fermented dairy product such as a yoghurt or a soft type cheese or a dairy product such as a processed cheese. CONSTITUTION: This stabilizer contains phosphorylated polysaccharides, produced by lactic acid bacteria and having a strong affinity for proteins as an active ingredient. The stabilizer is capable of improving the texture and solubility of a soft type cheese and reducing the amount of an added molten salt by adding thereof to a processed cheese.

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**CLAIMS**

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[Claim(s)]

[Claim 1]Stabilizer which makes an active principle a phosphorylated polysaccharide which lactic acid bacteria produce.

[Claim 2]A manufacturing method of a fermented dairy product using as stabilizer a phosphorylated polysaccharide which lactic acid bacteria produce.

[Claim 3]A manufacturing method of the fermented dairy product according to claim 2 which is that to which use as stabilizer adds a phosphorylated polysaccharide which lactic acid bacteria produce in a manufacturing process.

[Claim 4]The manufacturing method according to claim 3 whose fermented dairy product is yogurt.

[Claim 5]A manufacturing method of the fermented dairy product according to claim 2 whose use as stabilizer is a thing which makes phosphorylated polysaccharide production lactic acid bacteria produce a phosphorylated polysaccharide in a fermented dairy product in a manufacturing process.

[Claim 6]The manufacturing method according to claim 5 whose fermented dairy product is yogurt.

[Claim 7]The manufacturing method according to claim 5 whose fermented dairy product is a soft type cheese head.

[Claim 8]A manufacturing method of process cheese adding in a manufacturing process by making into stabilizer a phosphorylated polysaccharide which lactic acid bacteria produce.

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[Translation done.]

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## DETAILED DESCRIPTION

### [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the stabilizer which makes an active principle the phosphorylated polysaccharide which lactic acid bacteria produce. This invention relates to the method of manufacturing dairy products, such as a fermented dairy product and process cheese, using as stabilizer the phosphorylated polysaccharide which lactic acid bacteria produce. Stabilizer of this invention is useful as stabilizer of dairy products.

[0002]

[Description of the Prior Art] It faced manufacturing agitated type yogurt, settled type yogurt, etc. conventionally, and by heat-treating, whey protein, such as lactoglobulin in raw material milk and lactalbumin, is denatured enough, or it homogenizes, and the whey separation in a product is controlled. However, by the temperature change and the physical operation under conveyance of a product and preservation, the whey separation in a product often occurs and it has been a problem. It faces manufacturing drink yogurt, frozen yogurt, etc., By adding plant polysaccharides, such as alginate, locust bean gum, Cyamopsis Gum, and pectin, as stabilizer, and using together with homogenization, the whey separation in a product was prevented and mouthfeel, such as over a throat and mouth-melt, has also improved. However, in a product with comparatively low pH like fermented milk, since the quality of the lactoprotein in a product condenses and it is easy to cause precipitation, it not only demonstrates physical effects, such as viscosity, but the stabilizer which demonstrates chemical effects, such as compatibility with the quality of the lactoprotein, is called for. Soft type cheese heads which consumption is elongating in recent years, such as cream cheese, cottage cheese, and Camembert cheese, It is used as cooking or a confectionery raw material in many cases, and it has a smooth and soft texture and it can be said that what has the easy dissolution and mixing with other food materials is preferred. However, in low fat or non-fat type cottage cheese and a KUWARUKU cheese head, problems, such as gum-substance-izing of an organization and whey separation in a product, may arise. Each of these problems is based on destabilization of the organization by condensation of the quality of the lactoprotein in a low pH condition.

In order to improve such a problem, in chemical states, such as pH of the product itself, temperature, and specific gravity, the measure which raises the dispersibility and stability of the quality of the lactoprotein is needed.

[0003] With the process cheese manufactured as a raw material, natural cheese. It faced carrying out the heating and dissolving of the judged natural cheese, and fabricating it, emulsification of a fat is promoted, and condensed phosphate is added in order to stabilize an emulsified state, and improvement in the compatibility of the quality of the lactoprotein in process cheese and a fat is achieved. However, about this condensed phosphate, there is also knowledge that it is a substance to which the intensity of an osseous tissue is reduced in a human body, and it is in the tendency which refrains from that use in recent years. However, since decreasing the addition of condensed phosphate on the occasion of the heating and dissolving of natural cheese makes the emulsified state of process cheese unstable and it becomes causes, such as generating of fat separation, the substitute which demonstrates the same effect as condensed phosphate is called for.

[0004] On the other hand, it is known that various lactic acid bacteria will produce polysaccharide, and *Streptococcus Lactis* (*Streptococcuslactis*) or RAKUTOKOKKASU RAKUCHISU (*Lactococcuslactis*), to which it is reported that some strains of lactic acid micrococci, such as streptococcus Clemeau Rith (*Streptococcuscremoris*) or RAKUTOKOKKASU Clemeau Rith (*Lactococcuscremoris*), produce a phosphorylated polysaccharide. [JP,3-229702,A, Nakajima et al., Carbohydr. Res., Vol.224, pp.245-253-1992] . to which it is reported that some strains of lactobacilli, such as the *Lactobacillus salmon* (*Lactobacillussalmon*),

also produce a phosphorylated polysaccharide [WO 94/No. 12656 gazette]. Each of these phosphorylated polysaccharides Glucose, galactose, Monosaccharides, such as rhamnose, repeat fixed arrangement, a sugar chain is formed, and it differs from a neutral polysaccharide in that it has the structure which the phosphate group accompanied by a monosaccharide or a glycerol group combined via direct or another monosaccharide as the side chain. In three oxo acid which the phosphate group has, although two participate in an ester bond with a monosaccharide, since one which remains is a free state, it can participate in a reaction with other compounds. However, paying attention to the compatibility of such phosphorylated polysaccharides and quality of the lactoprotein, the trial in which a phosphorylated polysaccharide is used as stabilizer is not made.

[0005]

[Problem(s) to be Solved by the Invention] This invention persons found out that these problems were solvable by using the phosphorylated polysaccharide with strong compatibility with protein which lactic acid bacteria produce as a result of inquiring wholeheartedly about a means to solve various problems in a fermented dairy product and process cheese which were mentioned above. Namely, by adding a suitable quantity of a phosphorylated polysaccharide for a product after the end of a fermentation process in fermented dairy products, such as yogurt, Or by mixing the lactic acid bacteria which produce a phosphorylated polysaccharide in the starter culture used for manufacture, fermenting production of a phosphorylated polysaccharide in desirable temperature conditions, and making a phosphorylated polysaccharide contain in a product, The whey separation in a product was prevented and it found out that mouthfeel, such as mouth-melt and over a throat, could be raised. In fermented dairy products, such as a soft type cheese head, It found out that a product was improvable in the organization which it is smooth and is easy to dissolve by mixing the lactic acid bacteria which produce a phosphorylated polysaccharide in the starter culture used for manufacture, fermenting production of a phosphorylated polysaccharide in desirable temperature conditions, and introducing a phosphorylated polysaccharide into a product.

[0006] In dairy products, such as process cheese, by substituting a phosphorylated polysaccharide for some fused salt added by the manufacturing process of a product, it finds out that the addition of fused salt is reducible, and came to complete this invention. Therefore, this invention makes it SUBJECT to provide the stabilizer which makes an active principle the phosphorylated polysaccharide with strong compatibility with protein which lactic acid bacteria produce. This invention makes it SUBJECT to provide the method of manufacturing dairy products, such as fermented dairy products, such as yogurt and a soft type cheese head, and process cheese, using as stabilizer the phosphorylated polysaccharide with strong compatibility with protein which lactic acid bacteria produce.

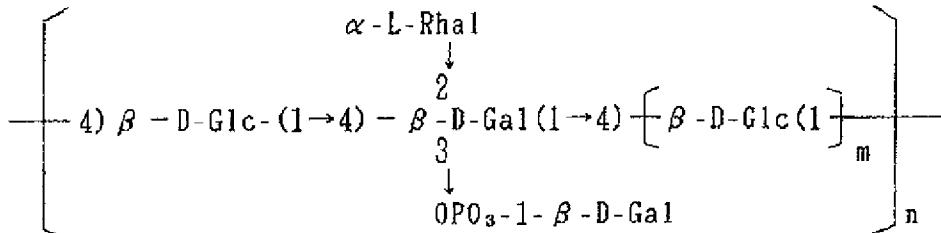
[0007]

[Means for Solving the Problem] This invention is made in order to solve an aforementioned problem, and it relates to stabilizer which makes an active principle a phosphorylated polysaccharide which lactic acid bacteria produce. An ingredient of stabilizer of this invention may be only a phosphorylated polysaccharide, and may add carriers, such as quality of the lactoprotein, such as sugar, such as milk sugar and starch, whey protein, and casein, quality of soybean protein, and egg protein, to a phosphorylated polysaccharide. This stabilizer is used as stabilizer of non-fermented dairy products, such as fermented dairy products, such as foodstuffs especially yogurt, and a soft type cheese head, process cheese, and a milk beverage, and can improve quality of these products that are mentioned later.

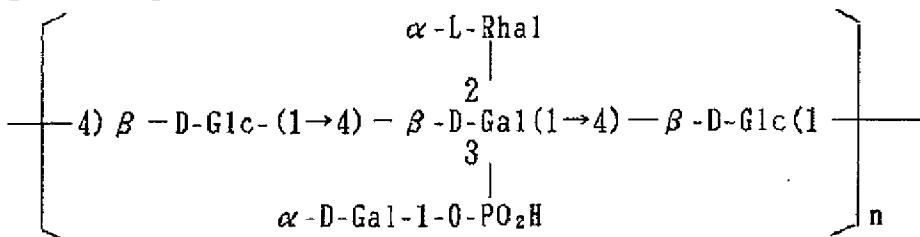
[0008] This invention is the method of manufacturing a fermented dairy product and process cheese using as stabilizer a phosphorylated polysaccharide which lactic acid bacteria produce. Use of a phosphorylated polysaccharide in this invention may use a phosphorylated polysaccharide as the stabilizer which could carry out \*\*\*\* addition and added a carrier etc. Add and cultivate a microorganism which furthermore produces a phosphorylated polysaccharide in a manufacturing process of a fermented dairy product, a phosphorylated polysaccharide is made to produce in a manufacturing process, and it may be made to contain this in a fermented dairy product. As described above, a phosphorylated polysaccharide which lactic acid bacteria of this invention produce WO 94/No. 12656 gazette, As indicated to JP,3-229702,A or Nakajima et al., Carbohydr. Res., vol.224, and pp.245-253-1992, it is a publicly known compound. The following structural formula can show this compound, for example.

[0009]

[Formula 1]



[0010]  
[Formula 2]



[0011](However, Glc in a formula shows glucose residue, Gal shows galactose residue, and Rha shows rhamnose residue, respectively.) A numerical value in a formula shows each binding site, m shows an integer of 0-3, and n shows a repeating unit, respectively.

In this invention, a phosphorylated polysaccharide which such lactic acid bacteria produce is added in a fermented dairy product – 0.01 to 10% of the weight, or mass production student \*\*\*\*\* of this level is preferred in a fermentation process of a fermented dairy product. A stage of addition is good to add after an end of a fermentation process in yogurt etc. If it adds with fused salt in process cheese, the amount of fused salt used can be reduced. This invention persons checked about whether it has the effect that this phosphorylated polysaccharide is equivalent to a plant polysaccharide currently conventionally used as stabilizer of a fermented dairy product, as an active principle of stabilizer of dairy products paying attention to a phosphorylated polysaccharide which lactic acid bacteria produce.

[0012]

[The example 1 of an examination] As a phosphorylated polysaccharide, Phosphorylated polysaccharide [Nakajima et al. which RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcus lactis subsp. cremoris) SBT0495 of a lactic acid micrococcus produced, Agitated type yogurt was made as an experiment, using alginate, locust bean gum, Cyamoposis Gum, and pectin as a plant polysaccharide, using Carbohydr. Res., vol.224, and pp.245-253-1992 example 1 reference]. Raw material milk adjusted to 11 to 13 % of the weight of fat rates was sterilized for 10 to 15 minutes at 80-90 \*\*, after cooling, 2-4 capacity % addition of a starter culture independently fermented in skim milk was done, and fermentation was started. And it fermented until acidity reached 0.8 – 0.9 with fermentation temperature of 37 \*\*, it added 0.5% of the weight after an end of fermentation by making an above-mentioned phosphorylated polysaccharide and a plant polysaccharide into stabilizer, and after cooling to about 4 \*\*, it agitated enough by a mixer. Thus, viscosity of a whey separation examination and appearance was measured about yogurt made as an experiment. In accordance with a centrifuge method to which gravity is applied compulsorily, with a centrifuge, it centrifuged for 10 minutes and a whey separation examination computed 1,000xg and a rate of measuring volume of whey and occupying to a whole product. Measurement of apparent viscosity was performed by shear rate  $50\text{sec}^{-1}$  using viscosity meter (VT500 and Haacke). The result is shown in Table 1. As shown in Table 1, as for phosphorylated polysaccharide addition yogurt, as compared with stabilizer additive-free yogurt, whey separation was greatly controlled like each plant polysaccharide addition yogurt.

[0013]

[Table 1]

	Whey separation (%)	viscosity (mPa.s)
Stabilizer additive-free yogurt	40.2	18
Phosphorylated polysaccharide addition yogurt	5.3	218
alginate addition yogurt	3.1	159
Locust-bean-gum addition yogurt	8.2	218
Cyamoposis Gum addition yogurt	4.2	
303 Pectin addition yogurt	5.6	266
[0014]Next, it checked about whether the effect of this phosphorylated polysaccharide is a thing originating in the polysaccharide of a phosphorylated polysaccharide, or it is a thing originating in the phosphate group of a phosphorylated polysaccharide.		

[0015]

[The example 2 of an examination] the phosphorylated polysaccharide used for the previous yogurt trial production -- the same. RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith.

(Lactococcus lactis subsp.cremoris) The phosphorylated polysaccharide which SBT0495 produced is hydrolyzed in accordance with the method [Carbohydr. Res., vol.224, pp.245–253, and 1992] of islets. The neutral polysaccharide which removed the phosphate group from the phosphorylated polysaccharide was prepared. This neutral polysaccharide has the structure where only the existence of the phosphate group side chain which galactose combined differs from a phosphorylated polysaccharide. The yogurt which added this neutral polysaccharide was made as an experiment in accordance with the method indicated for the example 1 of an examination, and it compared with stabilizer additive-free yogurt and phosphorylated polysaccharide addition yogurt about the situation of whey separation. The phosphorylated polysaccharide added the neutral polysaccharide 0.40% of the weight 0.45% of the weight so that viscosity might not influence and the viscosity of the appearance in shear rate  $50\text{sec}^{-1}$  might be set to 200mPa.s when adding a neutral polysaccharide and a phosphorylated polysaccharide. Measurement of whey separation was based on the centrifuge method which was mentioned above and to which gravity is applied compulsorily. The result is shown in drawing 1. About whey separation, when neutral polysaccharide addition yogurt was compared with phosphorylated polysaccharide addition yogurt, in phosphorylated polysaccharide addition yogurt, the depressor effect of clearly high whey separation was seen. When it adds in yogurt by making a phosphorylated polysaccharide into stabilizer from this, It turns out that the secondary effect by a certain operation originating in the phosphate group of not only the depressor effect of the whey separation which the viscosity originating in the polysaccharide of a phosphorylated polysaccharide brings about but a phosphorylated polysaccharide has contributed to control of whey separation.

[0016]The whey separation in fermented dairy products, such as yogurt and a cheese head, is produced, when casein which is main quality of the lactoprotein in a fermented dairy product loses an electric charge and destabilizes and condenses it under the pH condition near the isoelectric point. Originally, casein in milk constructs a bridge mutually for each other via calcium phosphate, by forming micellar structure, maintains stabilization and exists. It is suggested that this shows that casein has reactivity with a phosphate group, therefore the phosphate group of a phosphorylated polysaccharide has an interaction with casein also in a phosphorylated polysaccharide. Then, it checked about the interaction of the phosphate group of a phosphorylated polysaccharide, and casein.

[0017]

[The example 3 of an examination] The phosphorylated polysaccharide addition yogurt made as an experiment in the example 2 of an examination and neutral polysaccharide addition yogurt, and the yogurt which made pepsin of the protease act on these yogurt, and hydrolyzed the quality of the lactoprotein further were obtained, and those fluid characteristics were investigated. 100,000 units of pepsin and the sodium azide 0.2g were added to 1 l. of trial production yogurt, and hydrolysis of the quality of the lactoprotein was performed by carrying out 20 time processings at 37 \*\*. Measurement of the fluid characteristic used viscosity meter (VT500 and Haacke), measured shearing stress by the time program which rises or decreases a shear rate continuously, and asked for the flow curve. The result is shown in drawing 2. –in figure O– shows change of the temporal shearing stress at the time of a shear rate rise, and –\*\*– shows change of the temporal shearing stress at the time of shear rate reduction.

[0018]if the curve at the time of a shear rate rise (–O–) is observed in the flow curves A and C of two kinds of undecomposed milk protein trial production yogurt -- the curve A -- about 9.0 Pa (Y-intercept) of shearing stress from -- with the curve B, a clear Y-intercept is not seen to starting. The thing of the shearing stress shown the moment the sample which has a structure of a certain kind like the gel state has structure destroyed by shearing and starts a flow is called yield value, and, as for the curve A, it is shown clearly. This shows that phosphorylated polysaccharide addition yogurt has the character near gel with a structure of a certain kind like agar or gelatin. Although the size of the area which shows a difference with the curve of the shearing stress at the time of shear rate reduction is in inverse proportion to the plasticity of a fluid, since the area is smaller than the curve C, the curve A is understood that the phosphorylated polysaccharide addition yogurt of the plasticity of structure is stronger than neutral polysaccharide addition yogurt. The yield value which a big difference was not looked at by the flow curves B and D of two kinds of trial production yogurt which hydrolyzed the quality of the lactoprotein on the other hand, but was looked at by undecomposed milk protein trial production yogurt in phosphorylated polysaccharide addition protein decomposition treatment yogurt was indefinite. It was suggested that the phosphate group of the phosphorylated polysaccharide added in yogurt combined with the quality of the lactoprotein, and formed a gel structure from these results, and it became clear that the phosphate group of a phosphorylated polysaccharide has compatibility with the quality of the lactoprotein. Thus, since the phosphorylated polysaccharide had the operation which is not in a neutral

polysaccharide, the effect of fermented dairy products, such as yogurt and a cheese head, which carries out upgrading was expected by adding this phosphorylated polysaccharide as stabilizer.

[0019] Then, how to use this phosphorylated polysaccharide as stabilizer was examined by mixing the lactic acid bacteria which produce a phosphorylated polysaccharide in the starter culture currently used for manufacture of fermented dairy products, such as yogurt and a cheese head, and making a phosphorylated polysaccharide produce simultaneously with fermentation.

[0020]

[The example 4 of an examination] Conventionally, the lactic-acid-bacteria stock which produces a phosphorylated polysaccharide was mixed in the starter culture currently used for manufacture of a fermented dairy product, and a new starter culture was prepared in it. And when this new starter culture was cultivated at a suitable temperature for polysaccharide production, it investigated about whether sufficient vital force is maintainable. Usually, when evaluating the vital force of a starter culture, after cultivating a starter culture on certain conditions, it carries out by measuring acidity and pH. Then, the starter culture currently used for manufacture of fermented dairy products, such as yogurt and a cheese head, and the starter culture containing the lactic-acid-bacteria stock which produces the newly prepared phosphorylated polysaccharide were prepared, and the vital force examination was done. Six kinds of starter cultures which mixed the phosphorylated polysaccharide production lactic-acid-bacteria stock in three kinds of typical starter cultures for fermented milk, three kinds of starter cultures for soft type cheese heads, and those starter cultures are prepared, After any starter culture repeated culture and a passage 10 times or more by the reduction skim milk culture medium 10%, preculture liquid was inoculated into 1 l. of 10% reduction skim milk which sterilized 5%, and it cultivated at 20 \*\* for 18 hours. In accordance with the conventional method, acidity and pH were promptly measured after the end of culture. The result is shown in Table 2.

[0021] The prepared starter culture is the following 12 kinds.

A (starter culture for fermented milk separated from commercial fermented milk in accordance with the conventional method) : The streptococcus thermostat philus (Streptococcusthermophilus), Lactobacillus bulgaricus. (Lactobacillusbulgaricus). And Lactobacillus acid philus. (Lactobacillusacidophilus) B (starter culture for fermented milk separated from commercial fermented milk in accordance with the conventional method) : The streptococcus thermostat philus (Streptococcusthermophilus). And the Lactobacillus you glutei (Lactobacillusjugurti) (starter culture for fermented milk separated from commercial fermented milk in accordance with the conventional method) C : Lactobacillus acid philus (Lactobacillusacidophilus). And Lactobacillus bulgaricus (Lactobacillusbulgaricus) [0022]D (starter culture for polysaccharide production type fermented milk which mixed the polysaccharide production lactic-acid-bacteria stock in the starter culture of A) : The streptococcus thermostat philus (Streptococcusthermophilus), Lactobacillus bulgaricus (Lactobacillusbulgaricus), Lactobacillus acid philus (Lactobacillusacidophilus) and RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcuslactissubsp.cremoris). SBT0495 E (FERM P-10053) (starter culture for polysaccharide production type fermented milk which mixed the polysaccharide production lactic-acid-bacteria stock in the starter culture of B) : The streptococcus thermostat philus (Streptococcusthermophilus), The Lactobacillus you glutei. (Lactobacillusjugurti) and RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcuslactissubsp.cremoris) SBT0495F (a polysaccharide production lactic-acid-bacteria stock in the starter culture of C.) The mixed starter culture for polysaccharide production type fermented milk : Lactobacillus acid philus (Lactobacillusacidophilus), Lactobacillus bulgaricus (Lactobacillusbulgaricus) and RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcuslactissubsp.cremoris) SBT0495 [0023]G. (Starter culture for soft type cheese heads separated from the commercial soft type cheese head in accordance with the conventional method) : Streptococcus Lactis (Streptococcuslactis) and a streptococcus diacetilactis. (Streptococcusdiacetilactis) H (starter culture for soft type cheese heads separated from the commercial soft type cheese head in accordance with the conventional method) : Streptococcus Clemeau Rith (Streptococcuscremoris). And RAKUTOKOKKASU KAZEI (Lactococcuscaseri) I (starter culture for soft type cheese heads separated from the commercial soft type cheese head in accordance with the conventional method) : Streptococcus Clemeau Rith (Streptococcuscremoris). And Leuconostoc SHITOROBORAMU (Leuconostoccitrovorum) [0024]J (starter culture for polysaccharide production type soft type cheese heads which mixed the polysaccharide production lactic-acid-bacteria stock in the starter culture of G) : Streptococcus Lactis (Streptococcuslactis), A streptococcus diacetilactis (Streptococcusdiacetilactis) and RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcuslactissubsp.cremoris). SBT0495K (starter culture for polysaccharide production type soft type cheese heads which mixed the polysaccharide production lactic-acid-bacteria stock in the starter culture of H) : Streptococcus Clemeau Rith (Streptococcuscremoris), RAKUTOKOKKASU KAZEI. (Lactococcuscaseri) And RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith

(Lactococcus lactis subsp. cremoris) SBT0495L (a polysaccharide production lactic-acid-bacteria stock in the starter culture of I.) The mixed starter culture for polysaccharide production type soft type cheese heads : Streptococcus Clemeau Rith (Streptococcus cremoris), Leuconostoc SHITOROBORAMU (Leuconostoc citrovorum) and RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcus lactis subsp. cremoris) SBT0495 [0025]

[Table 2]

	Starter culture Acidity (%) pH.	A 0.87 4.59B0.89
4.60. C 0.80 4.53D0.95 4.63E1.04 4.70F0.92 4.65G0.85 4.61H0.88 4.65I0.92 4.71J0.90 4.61K0.92 4.66L0.97 4.74. -		

[0026] Although the acidity and pH of the starter culture after fixed time culture changed by mixing a phosphorylated polysaccharide production lactic-acid-bacteria stock, It is a range controllable by changing culture time, and it was judged that six kinds of starter cultures containing the newly prepared phosphorylated polysaccharide production lactic-acid-bacteria stock had sufficient vital force.

[0027]

[The example 5 of an examination] 12 kinds of starter cultures with which the vital force examination was presented were used, and yogurt was made as an experiment in accordance with the method indicated for the example 1 of an examination. Fermentation temperature shall be 20 \*\* desirable for production of a phosphorylated polysaccharide, and you made it ferment rather than usual for a long time, in using the starter culture D, E, and F which mixed the polysaccharide production strain, J, K, and L until acidity amounted to 0.80. And about six kinds of yogurt made as an experiment using the polysaccharide production type starter culture, the phosphorylated polysaccharide content in trial production yogurt was measured. The viscosity of a whey separation examination and appearance was measured about six kinds of yogurt made as an experiment using the starter culture for fermented milk. Measurement of phosphorylated polysaccharide content receives 1 l. of trial production yogurt, 100,000 units of pepsin and the sodium azide 0.2g of the protease were added, it heated for 30 minutes at 100 \*\* after decomposing the quality of the lactoprotein by carrying out 20 time processings at 37 \*\*, and the enzyme was deactivated. This nature decomposition product of the lactoprotein is cooled to 4 \*\*, and it is a hollow fiber type ultrafiltration equipment (cut-off-molecular-weight 3,000). Dilution by concentration and distilled water was repeated and ingredients other than polysaccharide were removed. And equivalent weight of ethanol was added to the collected concentrate, polysaccharide was collected as precipitation, and it was considered that the total amount of sugar was the content of a phosphorylated polysaccharide. The result is shown in Table 3.

[0028]

[Table 3]

	Starter culture Polysaccharide content (mg/l.).
D 192.0E121.1F158.8J189.6K165.5L104.2. In the yogurt made as an experiment using the polysaccharide production type starter culture containing a	phosphorylated polysaccharide production lactic-acid-bacteria stock, all contained the 100~200mg/l. phosphorylated polysaccharide.

[0029] About measurement of the viscosity of a whey separation examination and appearance, it carried out in accordance with the method mentioned above. The result is shown in drawing 3. Although the viscosity of the yogurt made as an experiment using the starter culture used for the usual yogurt manufacture was 5~15mPa.s, The viscosity of the yogurt made as an experiment using the polysaccharide production type starter culture containing a phosphorylated polysaccharide production lactic-acid-bacteria stock was 200~500mPa.s. Although whey separation of the yogurt made as an experiment using the starter culture used for the usual yogurt manufacture was 40 to 60%, Each whey separation of the yogurt made as an experiment using the polysaccharide production type starter culture containing a phosphorylated polysaccharide production lactic-acid-bacteria stock was 15% or less. Therefore, it was judged that the quantity of the phosphorylated polysaccharide produced by a phosphorylated polysaccharide production lactic-acid-bacteria stock by this fermentation condition was sufficient quantity to demonstrate that characteristic as stabilizer of yogurt. In the example of an examination, although the culture temperature of lactic acid bacteria was 20 \*\*, in order to produce a phosphorylated polysaccharide efficiently, it is preferred to cultivate lactic acid bacteria in a temperature requirement (15 \*\* ~ 25 \*\*).

[0030] The phosphorylated polysaccharide of this invention was investigated about the availability of the stabilizer made into an active principle about the substitution effect of the fused salt used for manufacture of process cheese.

[0031]

[The example 6 of an examination] It is fused salt to natural cheese. (condensed phosphate) The phosphorylated polysaccharide was added by different concentration and process cheese was made as an experiment. The Gouda type cheese head and the Cheddar type cheese head which measured the moisture

content beforehand were cut into the block like shape of about 1 cm, and after mixing at about 7:3 rate, water was blended so that the whole moisture might be 40%. After blending fused salt and/or a phosphorylated polysaccharide, it kneaded powerfully for 20 minutes in the glassware maintained in temperature of 80 \*\*. After this fusion process was completed, moved 10 ml of that liquefied cheese head to the centrifugal tube promptly, and centrifuged for 30 minutes by 60 \*\* and 10,000xg, fat separation was made to cause compulsorily, and the volume of the separated fat was measured. The result is shown in drawing 4, even when the addition of the fused salt added to natural cheese is reduced in the minute of the addition of the conventional fused salt half [ about ], by adding about 0.45% of the weight by making a phosphorylated polysaccharide into stabilizer shows that fat separation of process cheese can be controlled. Thus, by using as stabilizer the phosphorylated polysaccharide which the lactic acid bacteria of this invention produce shows that whey separation of a fermented dairy product can be prevented and mouthfeel, such as mouth-melt and smoothness, can be raised. It turns out that it can substitute for some condensed phosphate used as fused salt when manufacturing process cheese.

[0032]As a phosphorylated polysaccharide which can be used as an active principle of stabilizer of this invention, Streptococcus Lactis (Streptococcus lactis) or RAKUTOKOKKASU RAKUCHISU (Lactococcus lactis), Phosphorylated polysaccharide [JP,3-229702,A which some strains of lactic acid micrococci, such as streptococcus Clemeau Rith (Streptococcus cremoris) or RAKUTOKOKKASU Clemeau Rith (Lactococcus cremoris), produce, Nakajima et al. and Carbohydr. Phosphorylated polysaccharide [WO 94/No. 12656 gazette] etc. which some strains of lactobacilli, such as Res., vol.224, pp.245-253-1992], and the Lactobacillus salmon (Lactobacillus sake), produce can be illustrated. As a lactic-acid-bacteria stock which produces the phosphorylated polysaccharide mixed in the starter culture of a fermented dairy product, Streptococcus Lactis (Streptococcus lactis) SBT 1209 (FERM P-8308) and streptococcus Clemeau Rith (Streptococcus cremoris) SBT. 0495 (FERM P-10053) etc. -- lactic-acid-bacteria stock [JP,3-229702,A] can be illustrated.

[0033]Next, an example is shown and this invention is explained in detail.

[Work example 1]Otto et al. According to the statement of [FEMS Microbiol. Lett., vol.16, pp.69-74, and 1990], 4 l. of total synthesis culture media were prepared. Filtration sterilization of this culture medium was carried out, and 5 liter-capacity jar fermenter (Applikon) performed constant pH culture which maintains pH to 6.3 with automatic titration of 3N potassium hydrate. After cultivating RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcus lactis spp. cremoris) SBT 0495 (FERM P-10053) as phosphorylated polysaccharide production lactic acid bacteria for about 55 hours, Abbreviation 4.7-l. culture medium was collected. This culture medium is centrifuged. (for 20,000xg and 60 minutes) Supernatant liquid abbreviation obtained by carrying out and removing a biomass thoroughly Equivalent weight of ethanol was mixed to 4.5 l., and the phosphorylated polysaccharide was settled. After carrying out settling centrifugal separation (for 4,000xg and 10 minutes), collecting them and fully dissolving with 500 ml of pure water, it is ethanol again. Operation of settling a phosphorylated polysaccharide by 500 ml was repeated twice, and phosphorylated polysaccharide partially purified substance was obtained. The dry weight of this phosphorylated polysaccharide partially purified substance is about 3.8g, and that sugar content and phosphoric acid content are about 65.5% and abbreviation, respectively. It was 7.8%. Enzyme pronase (Boehringer) decomposes protein for this part, As a result of ethanol precipitation's re-recovering refining phosphorylated polysaccharides, preparing a dry matter and calculating the purity of a phosphorylated polysaccharide from the weight before protein decomposition treatment, and the weight after processing, the purity of phosphorylated polysaccharide partially purified substance was about 72%. This phosphorylated polysaccharide partially purified substance was made into the active principle of stabilizer of this invention.

[0034]

[Work example 2]It added 0.3% of the weight by making into stabilizer the phosphorylated polysaccharide obtained in Example 1 after the end of a fermentation process of the agitated type yogurt made as an experiment in accordance with the conventional method, drink yogurt, sour cream, and frozen yogurt. On the other hand, a prototype was built also about the stabilizer additive-free contrast article, and a whey separation examination and organoleptics of each prototype were done. The whey separation examination was done by the method into which whey is made to divide compulsorily by centrifugal separation, and after thawing at the room temperature about frozen yogurt, it examined. Organoleptics were evaluated by ten panelists about smoothness and over the throat in four steps. The result is shown in Table 4. In the prototype which added the phosphorylated polysaccharide as stabilizer, whey separation has been improved about 20 to 40%, and smoothness and mouthfeel called over a throat have also been improved. Also in which prototype, it hardly changes to a contrast article in respect of flavor.

[0035]

[Table 4]

各種液状発酵乳製品の評価

製 品	ホエー分離*	官能評価**	
		滑らかさ	喉ごし
攪拌型ヨーグルト	38.5	△	○
攪拌型ヨーグルト(添加)	7.9	○	○
ドリンクヨーグルト	66.2	×	○
ドリンクヨーグルト(添加)	22.8	◎	◎
サワークリーム	28.3	○	○
サワークリーム(添加)	9.0	○	○
フローズンヨーグルト	43.5	△	△
フローズンヨーグルト(添加)	20.1	◎	◎

\* フローズンヨーグルトの場合は、室温で解凍してから測定を行った。

\*\*良好：◎ やや良：○ ふつう：△ 不良：×

## [0036]

[Work example 3] Agitated type yogurt, solidified type yogurt, drink yogurt, and frozen yogurt were made as an experiment using the starter culture for fermented milk used in the example 4 of an examination, and the example 5 of an examination. About the starter culture which mixed the phosphorylated polysaccharide production lactic-acid-bacteria stock, fermentation temperature was 20 \*\*, and the usual manufacturing method was followed except making it ferment rather than usual for a long time until acidity amounted to 0.80. And a whey separation examination and organoleptics of each prototype were done. The whey separation examination was done by the method into which whey is made to divide compulsorily by centrifugal separation, and after thawing at the room temperature about frozen yogurt, it examined. Organoleptics were evaluated by ten panelists about smoothness and over the throat in four steps. The result is shown in Table 5.

## [0037]

## [Table 5]

各種液状発酵乳製品の評価

製 品	スター	ホエー分離*	官能評価**	
			滑らかさ	喉ごし
攪拌型ヨーグルト	通常型A	35.1	△	○
攪拌型ヨーグルト	多糖類型D	10.2	◎	○
凝固型ヨーグルト	通常型A	46.0	△	○
凝固型ヨーグルト	多糖類型D	13.2	○	○
ドリンクヨーグルト	通常型B	68.7	×	○
ドリンクヨーグルト	多糖類型E	33.8	◎	○
フローズンヨーグルト	通常型C	38.5	△	△
フローズンヨーグルト	多糖類型F	24.1	◎	○

\* フローズンヨーグルトについては解凍後に測定を行った。

\*\*良好：◎ やや良：○ ふつう：△ 不良：×

## [0038]

[Work example 4] Camembert cheese, cottage cheese, and cream cheese were made as an experiment in accordance with the conventional method using the starter culture for soft type cheese heads used in the example 4 of an examination, and the example 5 of an examination. And organoleptics estimated the texture of each prototype. About Camembert cheese, the sample which removed the layer part by mildew was prepared, and the coefficient of viscosity and the elastic modulus were measured using the rheometer. When using for cooking or a confectionery raw material about cottage cheese and cream cheese, the panelist estimated three items of smoothness, mouth-melt, and whey separation like Example 3 as the desirable characteristic in four steps. About a soluble examination, it is a cheese head to a 200-ml \*\* beaker. Weighing of the 10 g was carried out, 90 ml of 80 \*\* warm water was added to this, and a stirring bar 4 cm in length was put in, and it agitated

for 2 minutes by 650 rpm/min, maintaining 80 \*\* with a magnetic stirrer with the heater for an experiment. Then, it quenched at 20 \*\* or less in ice water promptly, it filtered by the nylon mesh 150 which measured weight beforehand, and insoluble matters were collected. After draining on the paper wiper the whole nylon mesh, weighing was carried out, the rate of the cheese head which dissolved from the weight of the insoluble matter was computed, and it was considered as the soluble index.

[0039] About Camembert cheese, the result of a coefficient of viscosity and an elastic modulus, and organic-functions evaluation is shown in Table 6. When a polysaccharide production type starter culture was used so that it may see in Table 6, both the coefficient of viscosity and the elastic modulus increased, and it acted as Kougam in respect of smoothness, mouth-melt, etc. also in organic-functions evaluation.

[0040]

[Table 6]

試作カマベールチーズの評価

スター	粘性率 (g/cm/sec)	弹性率 (g/cm/ sec <sup>2</sup> )	官能評価*		
			滑らかさ	口溶け	ホエー分離
通常型H	43	0.64	△	○	◎
多糖類型K	52	0.83	○	◎	◎

\* 良好：◎ やや良：○ ふつう：△ 不良：×

[0041] The result of solubility and organic-functions evaluation is shown in Table 7 about cottage cheese and cream cheese. When a polysaccharide production type starter culture was used so that it may see in Table 7, solubility improved and evaluation improved also in which point of smoothness, mouth-melt, and whey separation.

[0042]

[Table 7]

試作ソフトタイプチーズの評価

チーズ	スター	溶解性 (%)	官能評価*		
			滑らかさ	口溶け	ホエー分離
カッテージチーズ	通常型G	45.6	×	×	○
カッテージチーズ	通常型I	38.9	×	×	○
カッテージチーズ	多糖類型J	73.0	△	△	◎
カッテージチーズ	多糖類型L	64.1	△	△	◎
クリームチーズ	通常型G	61.1	○	○	○
クリームチーズ	通常型I	58.2	○	○	○
クリームチーズ	多糖類型J	85.1	◎	◎	◎
クリームチーズ	多糖類型L	73.8	◎	◎	◎

\* 良好：◎ やや良：○ ふつう：△ 不良：×

[0043]

[Work example 5] In accordance with the conventional method, process cheese was made as an experiment. That in which usual added condensed phosphate 3% of the weight as fused salt in the process of dissolving natural cheese, It is condensed phosphate as fused salt. Phosphorylated polysaccharide obtained in Example 1 as 1.5 % of the weight and stabilizer The thing added 0.4% of the weight, and fused salt and a stabilizer additive-free thing were made as an experiment. About the quality of the prototype, organoleptics estimated, and under the conditions of the temperature of 50 \*\*, and 70% of humidity, it saves for 24 hours, forcible degradation was carried out, and separation of a fat or moisture was inspected. The result is shown in Table 8. The organization of fused salt and stabilizer additive-free trial production process cheese breaks easily so that it may see in Table 8.

In separation of the fat by compulsive degradation, or moisture, it was not desirable.

The trial production process cheese which made the addition of fused salt the usual half and added the phosphorylated polysaccharide as stabilizer on the other hand was quality usually equivalent to elegance at the point of an organization or flavor again at the result of the forced life test.

[0044]

[Table 8]

## 試作プロセスチーズの評価

プロセスチーズの種類	官能評価		強制劣化試験	
	組織	風味	脂肪分離	水分分離
溶融塩 3 % 添加 (標準品)	良好	良好	良好	良好
溶融塩無添加	碎け易い	普通	不良	不良
溶融塩 1.5% + リン酸化多糖類 0.4%	良好	良好	良好	良好

[0045]

[Effect of the Invention] In fermented dairy products, such as yogurt, prevention and mouthfeel of whey separation can be raised by using stabilizer of this invention which makes an active principle the phosphorylated polysaccharide with high quality of the lactoprotein and compatibility which lactic acid bacteria produce. Solubility can be raised in soft type cheese heads used for cooking or a confectionery raw material, such as cream cheese and cottage cheese. In manufacture of process cheese, it becomes possible to reduce the addition of fused salt by half. The lactic acid bacteria traditionally used for the fermented dairy product produce the phosphorylated polysaccharide used as an active principle of stabilizer of this invention. Recognition (GRAS:Generally Recognized As Safe) as a safe thing. Since it is established, it can use as edible satisfactorily at all.

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[Translation done.]

**\* NOTICES \***

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**TECHNICAL FIELD**

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[Industrial Application] This invention relates to the stabilizer which makes an active principle the phosphorylated polysaccharide which lactic acid bacteria produce. This invention relates to the method of manufacturing dairy products, such as a fermented dairy product and process cheese, using as stabilizer the phosphorylated polysaccharide which lactic acid bacteria produce. Stabilizer of this invention is useful as stabilizer of dairy products.

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[Translation done.]

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## PRIOR ART

[Description of the Prior Art] It faced manufacturing agitated type yogurt, settled type yogurt, etc. conventionally, and by heat-treating, whey protein, such as lactoglobulin in raw material milk and lactalbumin, is denatured enough, or it homogenizes, and the whey separation in a product is controlled. However, by the temperature change and the physical operation under conveyance of a product and preservation, the whey separation in a product often occurs and it has been a problem. It faces manufacturing drink yogurt, frozen yogurt, etc., By adding plant polysaccharides, such as alginate, locust bean gum, Cyamopsis Gum, and pectin, as stabilizer, and using together with homogenization, the whey separation in a product was prevented and mouthfeel, such as over a throat and mouth-melt, has also improved. However, in a product with comparatively low pH like fermented milk, since the quality of the lactoprotein in a product condenses and it is easy to cause precipitation, it not only demonstrates physical effects, such as viscosity, but the stabilizer which demonstrates chemical effects, such as compatibility with the quality of the lactoprotein, is called for. Soft type cheese heads which consumption is elongating in recent years, such as cream cheese, cottage cheese, and Camembert cheese, It is used as cooking or a confectionery raw material in many cases, and it has a smooth and soft texture and it can be said that what has the easy dissolution and mixing with other food materials is preferred. However, in low fat or non-fat type cottage cheese and a KUWARUKU cheese head, problems, such as gum-substance-izing of an organization and whey separation in a product, may arise. Each of these problems is based on destabilization of the organization by condensation of the quality of the lactoprotein in a low pH condition.

In order to improve such a problem, in chemical states, such as pH of the product itself, temperature, and specific gravity, the measure which raises the dispersibility and stability of the quality of the lactoprotein is needed.

[0003] With the process cheese manufactured as a raw material, natural cheese. It faced carrying out the heating and dissolving of the judged natural cheese, and fabricating it, emulsification of a fat is promoted, and condensed phosphate is added in order to stabilize an emulsified state, and improvement in the compatibility of the quality of the lactoprotein in process cheese and a fat is achieved. However, about this condensed phosphate, there is also knowledge that it is a substance to which the intensity of an osseous tissue is reduced in a human body, and it is in the tendency which refrains from that use in recent years. However, since decreasing the addition of condensed phosphate on the occasion of the heating and dissolving of natural cheese makes the emulsified state of process cheese unstable and it becomes causes, such as generating of fat separation, the substitute which demonstrates the same effect as condensed phosphate is called for.

[0004] On the other hand, it is known that various lactic acid bacteria will produce polysaccharide, and Streptococcus Lactis (Streptococcuslactis) or RAKUTOKOKKASU RAKUCHISU (Lactococcuslactis), to which it is reported that some strains of lactic acid micrococci, such as streptococcus Clemeau Rith (Streptococcuscremoris) or RAKUTOKOKKASU Clemeau Rith (Lactococcuscremoris), produce a phosphorylated polysaccharide. [JP,3-229702,A, Nakajima et al., Carbohydr. Res., Vol.224, pp.245-253-1992]. to which it is reported that some strains of lactobacilli, such as the Lactobacillus salmon (Lactobacillussake), also produce a phosphorylated polysaccharide [WO 94/No. 12656 gazette]. Each of these phosphorylated polysaccharides Glucose, galactose, Monosaccharides, such as rhamnose, repeat fixed arrangement, a sugar chain is formed, and it differs from a neutral polysaccharide in that it has the structure which the phosphate group accompanied by a monosaccharide or a glycerol group combined via direct or another monosaccharide as the side chain. In three oxo acid which the phosphate group has, although two participate in an ester bond with a monosaccharide, since one which remains is a free state, it can participate in a reaction with other compounds. However, paying attention to the compatibility of such phosphorylated polysaccharides and quality of the lactoprotein, the trial in which a phosphorylated polysaccharide is used as stabilizer is not made.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention]In fermented dairy products, such as yogurt, prevention and mouthfeel of whey separation can be raised by using stabilizer of this invention which makes an active principle the phosphorylated polysaccharide with high quality of the lactoprotein and compatibility which lactic acid bacteria produce. Solubility can be raised in soft type cheese heads used for cooking or a confectionery raw material, such as cream cheese and cottage cheese. In manufacture of process cheese, it becomes possible to reduce the addition of fused salt by half. The lactic acid bacteria traditionally used for the fermented dairy product produce the phosphorylated polysaccharide used as an active principle of stabilizer of this invention. Recognition (GRAS:Generally Recognized As Safe) as a safe thing. Since it is established, it can use as edible satisfactorily at all.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] This invention persons found out that these problems were solvable by using the phosphorylated polysaccharide with strong compatibility with protein which lactic acid bacteria produce as a result of inquiring wholeheartedly about a means to solve various problems in a fermented dairy product and process cheese which were mentioned above. Namely, by adding a suitable quantity of a phosphorylated polysaccharide for a product after the end of a fermentation process in fermented dairy products, such as yogurt, Or by mixing the lactic acid bacteria which produce a phosphorylated polysaccharide in the starter culture used for manufacture, fermenting production of a phosphorylated polysaccharide in desirable temperature conditions, and making a phosphorylated polysaccharide contain in a product, The whey separation in a product was prevented and it found out that mouthfeel, such as mouth-melt and over a throat, could be raised. In fermented dairy products, such as a soft type cheese head, It found out that a product was improvable in the organization which it is smooth and is easy to dissolve by mixing the lactic acid bacteria which produce a phosphorylated polysaccharide in the starter culture used for manufacture, fermenting production of a phosphorylated polysaccharide in desirable temperature conditions, and introducing a phosphorylated polysaccharide into a product.

[0006] In dairy products, such as process cheese, by substituting a phosphorylated polysaccharide for some fused salt added by the manufacturing process of a product, it finds out that the addition of fused salt is reducible, and came to complete this invention. Therefore, this invention makes it SUBJECT to provide the stabilizer which makes an active principle the phosphorylated polysaccharide with strong compatibility with protein which lactic acid bacteria produce. This invention makes it SUBJECT to provide the method of manufacturing dairy products, such as fermented dairy products, such as yogurt and a soft type cheese head, and process cheese, using as stabilizer the phosphorylated polysaccharide with strong compatibility with protein which lactic acid bacteria produce.

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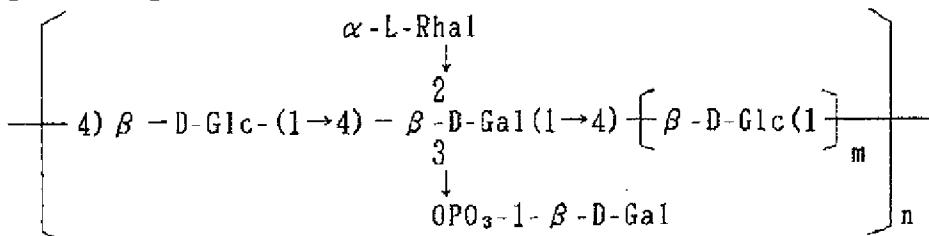
## MEANS

[Means for Solving the Problem] This invention is made in order to solve an aforementioned problem, and it relates to stabilizer which makes an active principle a phosphorylated polysaccharide which lactic acid bacteria produce. An ingredient of stabilizer of this invention may be only a phosphorylated polysaccharide, and may add carriers, such as quality of the lactoprotein, such as sugar, such as milk sugar and starch, whey protein, and casein, quality of soybean protein, and egg protein, to a phosphorylated polysaccharide. This stabilizer is used as stabilizer of non-fermented dairy products, such as fermented dairy products, such as foodstuffs especially yogurt, and a soft type cheese head, process cheese, and a milk beverage, and can improve quality of these products that are mentioned later.

[0008] This invention is the method of manufacturing a fermented dairy product and process cheese using as stabilizer a phosphorylated polysaccharide which lactic acid bacteria produce. Use of a phosphorylated polysaccharide in this invention may use a phosphorylated polysaccharide as the stabilizer which could carry out \*\*\*\* addition and added a carrier etc. Add and cultivate a microorganism which furthermore produces a phosphorylated polysaccharide in a manufacturing process of a fermented dairy product, a phosphorylated polysaccharide is made to produce in a manufacturing process, and it may be made to contain this in a fermented dairy product. As described above, a phosphorylated polysaccharide which lactic acid bacteria of this invention produce WO 94/No. 12656 gazette, As indicated to JP,3-229702,A or Nakajima et al., Carbohydr. Res., vol.224, and pp.245-253-1992, it is a publicly known compound. The following structural formula can show this compound, for example.

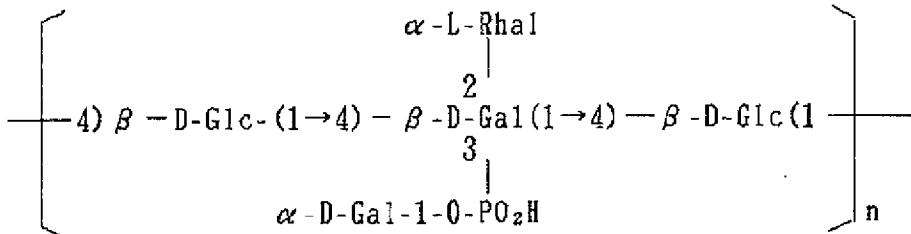
[0009]

[Formula 1]



[0010]

[Formula 2]



[0011] (However, Glc in a formula shows glucose residue, Gal shows galactose residue, and Rha shows rhamnose residue, respectively.) The numerical value in a formula shows each binding site, m shows the integer of 0-3, and n shows a repeating unit, respectively.

In this invention, the phosphorylated polysaccharide which such lactic acid bacteria produce is added in a fermented dairy product - 0.01 to 10% of the weight, or mass production student \*\*\*\*\* of this level is preferred in the fermentation process of a fermented dairy product. The stage of addition is good to add after the end of a fermentation process in yogurt etc. If it adds with fused salt in process cheese, the amount of the fused salt used can be reduced. This invention persons checked about whether it has the effect that this

phosphorylated polysaccharide is equivalent to the plant polysaccharide currently conventionally used as stabilizer of a fermented dairy product, as an active principle of stabilizer of dairy products paying attention to the phosphorylated polysaccharide which lactic acid bacteria produce.

[0012]

[The example 1 of an examination] As a phosphorylated polysaccharide, Phosphorylated polysaccharide [Nakajima et al. which RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (*Lactococcus lactis subsp. cremoris*) SBT0495 of a lactic acid micrococcus produced, Agitated type yogurt was made as an experiment, using alginate, locust bean gum, Cyamoposis Gum, and pectin as a plant polysaccharide, using Carbohydr. Res., vol.224, and pp.245–253–1992 example 1 reference]. Raw material milk adjusted to 11 to 13 % of the weight of fat rates was sterilized for 10 to 15 minutes at 80–90 \*\*, after cooling, 2–4 capacity % addition of a starter culture independently fermented in skim milk was done, and fermentation was started. And it fermented until acidity reached 0.8 – 0.9 with fermentation temperature of 37 \*\*, it added 0.5% of the weight after an end of fermentation by making an above-mentioned phosphorylated polysaccharide and a plant polysaccharide into stabilizer, and after cooling to about 4 \*\*, it agitated enough by a mixer. Thus, viscosity of a whey separation examination and appearance was measured about yogurt made as an experiment. In accordance with a centrifuge method to which gravity is applied compulsorily, with a centrifuge, it centrifuged for 10 minutes and a whey separation examination computed 1,000xg and a rate of measuring volume of whey and occupying to a whole product. Measurement of apparent viscosity was performed by shear rate  $50\text{sec}^{-1}$  using viscosity meter (VT500 and Haacke). The result is shown in Table 1. As shown in Table 1, as for phosphorylated polysaccharide addition yogurt, as compared with stabilizer additive-free yogurt, whey separation was greatly controlled like each plant polysaccharide addition yogurt.

[0013]

[Table 1]

	Whey separation (%)	viscosity (mPa.s)
Stabilizer additive-free yogurt	40.2	18.
Phosphorylated polysaccharide addition yogurt	5.3	218
alginate addition yogurt	3.1	159
Locust-bean-gum addition yogurt	8.2	218
Cyamoposis Gum addition yogurt	4.2	303
Pectin addition yogurt	5.6	266.

[0014] Next, it checked about whether the effect of this phosphorylated polysaccharide is a thing originating in the polysaccharide of a phosphorylated polysaccharide, or it is a thing originating in the phosphate group of a phosphorylated polysaccharide.

[0015]

[The example 2 of an examination] the phosphorylated polysaccharide used for the previous yogurt trial production — the same. RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith.

(*Lactococcus lactis subsp. cremoris*) The phosphorylated polysaccharide which SBT0495 produced is hydrolyzed in accordance with the method [Carbohydr. Res., vol.224, pp.245–253, and 1992] of islets, The neutral polysaccharide which removed the phosphate group from the phosphorylated polysaccharide was prepared. This neutral polysaccharide has the structure where only the existence of the phosphate group side chain which galactose combined differs from a phosphorylated polysaccharide. The yogurt which added this neutral polysaccharide was made as an experiment in accordance with the method indicated for the example 1 of an examination, and it compared with stabilizer additive-free yogurt and phosphorylated polysaccharide addition yogurt about the situation of whey separation. The phosphorylated polysaccharide added the neutral polysaccharide 0.40% of the weight 0.45% of the weight so that viscosity might not influence and the viscosity of the appearance in shear rate  $50\text{sec}^{-1}$  might be set to 200mPa.s when adding a neutral polysaccharide and a phosphorylated polysaccharide. Measurement of whey separation was based on the centrifuge method which was mentioned above and to which gravity is applied compulsorily. The result is shown in drawing 1. About whey separation, when neutral polysaccharide addition yogurt was compared with phosphorylated polysaccharide addition yogurt, in phosphorylated polysaccharide addition yogurt, the depressor effect of clearly high whey separation was seen. When it adds in yogurt by making a phosphorylated polysaccharide into stabilizer from this, It turns out that the secondary effect by a certain operation originating in the phosphate group of not only the depressor effect of the whey separation which the viscosity originating in the polysaccharide of a phosphorylated polysaccharide brings about but a phosphorylated polysaccharide has contributed to control of whey separation.

[0016] The whey separation in fermented dairy products, such as yogurt and a cheese head, is produced, when casein which is main quality of the lactoprotein in a fermented dairy product loses an electric charge and destabilizes and condenses it under the pH condition near the isoelectric point. Originally, casein in milk constructs a bridge mutually for each other via calcium phosphate, by forming micellar structure, maintains

stabilization and exists. It is suggested that this shows that casein has reactivity with a phosphate group, therefore the phosphate group of a phosphorylated polysaccharide has an interaction with casein also in a phosphorylated polysaccharide. Then, it checked about the interaction of the phosphate group of a phosphorylated polysaccharide, and casein.

[0017]

[The example 3 of an examination] The phosphorylated polysaccharide addition yogurt made as an experiment in the example 2 of an examination and neutral polysaccharide addition yogurt, and the yogurt which made pepsin of the protease act on these yogurt, and hydrolyzed the quality of the lactoprotein further were obtained, and those fluid characteristics were investigated. 100,000 units of pepsin and the sodium azide 0.2g were added to 1 l. of trial production yogurt, and hydrolysis of the quality of the lactoprotein was performed by carrying out 20 time processings at 37 \*\*. Measurement of the fluid characteristic used viscosity meter (VT500 and Haacke), measured shearing stress by the time program which rises or decreases a shear rate continuously, and asked for the flow curve. The result is shown in drawing 2. -in figure O- shows change of the temporal shearing stress at the time of a shear rate rise, and -\*\*- shows change of the temporal shearing stress at the time of shear rate reduction.

[0018]if the curve at the time of a shear rate rise (-O-) is observed in the flow curves A and C of two kinds of undecomposed milk protein trial production yogurt -- the curve A -- about 9.0 Pa (Y-intercept) of shearing stress from -- with the curve B, a clear Y-intercept is not seen to starting. The thing of the shearing stress shown the moment the sample which has a structure of a certain kind like the gel state has structure destroyed by shearing and starts a flow is called yield value, and, as for the curve A, it is shown clearly. This shows that phosphorylated polysaccharide addition yogurt has the character near gel with a structure of a certain kind like agar or gelatin. Although the size of the area which shows a difference with the curve of the shearing stress at the time of shear rate reduction is in inverse proportion to the plasticity of a fluid, since the area is smaller than the curve C, the curve A is understood that the phosphorylated polysaccharide addition yogurt of the plasticity of structure is stronger than neutral polysaccharide addition yogurt. The yield value which a big difference was not looked at by the flow curves B and D of two kinds of trial production yogurt which hydrolyzed the quality of the lactoprotein on the other hand, but was looked at by undecomposed milk protein trial production yogurt in phosphorylated polysaccharide addition protein decomposition treatment yogurt was indefinite. It was suggested that the phosphate group of the phosphorylated polysaccharide added in yogurt combined with the quality of the lactoprotein, and formed a gel structure from these results, and it became clear that the phosphate group of a phosphorylated polysaccharide has compatibility with the quality of the lactoprotein. Thus, since the phosphorylated polysaccharide had the operation which is not in a neutral polysaccharide, the effect of fermented dairy products, such as yogurt and a cheese head, which carries out upgrading was expected by adding this phosphorylated polysaccharide as stabilizer.

[0019]Then, how to use this phosphorylated polysaccharide as stabilizer was examined by mixing the lactic acid bacteria which produce a phosphorylated polysaccharide in the starter culture currently used for manufacture of fermented dairy products, such as yogurt and a cheese head, and making a phosphorylated polysaccharide produce simultaneously with fermentation.

[0020]

[The example 4 of an examination] Conventionally, the lactic-acid-bacteria stock which produces a phosphorylated polysaccharide was mixed in the starter culture currently used for manufacture of a fermented dairy product, and a new starter culture was prepared in it. And when this new starter culture was cultivated at a suitable temperature for polysaccharide production, it investigated about whether sufficient vital force is maintainable. Usually, when evaluating the vital force of a starter culture, after cultivating a starter culture on certain conditions, it carries out by measuring acidity and pH. Then, the starter culture currently used for manufacture of fermented dairy products, such as yogurt and a cheese head, and the starter culture containing the lactic-acid-bacteria stock which produces the newly prepared phosphorylated polysaccharide were prepared, and the vital force examination was done. Six kinds of starter cultures which mixed the phosphorylated polysaccharide production lactic-acid-bacteria stock in three kinds of typical starter cultures for fermented milk, three kinds of starter cultures for soft type cheese heads, and those starter cultures are prepared. After any starter culture repeated culture and a passage 10 times or more by the reduction skim milk culture medium 10%, preculture liquid was inoculated into 1 l. of 10% reduction skim milk which sterilized 5%, and it cultivated at 20 \*\* for 18 hours. In accordance with the conventional method, acidity and pH were promptly measured after the end of culture. The result is shown in Table 2.

[0021]The prepared starter culture is the following 12 kinds.

A (starter culture for fermented milk separated from commercial fermented milk in accordance with the conventional method) : The streptococcus thermostat philus (Streptococcusthermophilus), Lactobacillus

bulgaricus. (Lactobacillusbulgaricus). And Lactobacillus acidophilus. (Lactobacillusacidophilus) B (starter culture for fermented milk separated from commercial fermented milk in accordance with the conventional method) : The streptococcus thermostat philus (Streptococcusthermophilus). And the Lactobacillus you glutei (Lactobacillusjugurti) (starter culture for fermented milk separated from commercial fermented milk in accordance with the conventional method) C : Lactobacillus acidophilus (Lactobacillusacidophilus). And Lactobacillus bulgaricus (Lactobacillusbulgaricus) [0022]D (starter culture for polysaccharide production type fermented milk which mixed the polysaccharide production lactic-acid-bacteria stock in the starter culture of A) : The streptococcus thermostat philus (Streptococcusthermophilus), Lactobacillus bulgaricus (Lactobacillusbulgaricus), Lactobacillus acidophilus (Lactobacillusacidophilus) and RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcuslactissubsp.cremoris). SBT0495 E (FERM P-10053) (starter culture for polysaccharide production type fermented milk which mixed the polysaccharide production lactic-acid-bacteria stock in the starter culture of B) : The streptococcus thermostat philus (Streptococcusthermophilus), The Lactobacillus you glutei. (Lactobacillusjugurti) and RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcuslactissubsp.cremoris) SBT0495F (a polysaccharide production lactic-acid-bacteria stock in the starter culture of C.) The mixed starter culture for polysaccharide production type fermented milk : Lactobacillus acidophilus (Lactobacillusacidophilus), Lactobacillus bulgaricus (Lactobacillusbulgaricus) and RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcuslactissubsp.cremoris) SBT0495 [0023]G. (Starter culture for soft type cheese heads separated from the commercial soft type cheese head in accordance with the conventional method) : Streptococcus Lactis (Streptococcuslactis) and a streptococcus diacetilactis. (Streptococcussdiacetilactis) H (starter culture for soft type cheese heads separated from the commercial soft type cheese head in accordance with the conventional method) : Streptococcus Clemeau Rith (Streptococcuscremoris). And RAKUTOKOKKASU KAZEI (Lactococcuscasei) I (starter culture for soft type cheese heads separated from the commercial soft type cheese head in accordance with the conventional method) : Streptococcus Clemeau Rith (Streptococcuscremoris). And Leuconostoc SHITOROBORAMU (Leuconostoccitrovorum) [0024]J (starter culture for polysaccharide production type soft type cheese heads which mixed the polysaccharide production lactic-acid-bacteria stock in the starter culture of G) : Streptococcus Lactis (Streptococcuslactis), A streptococcus diacetilactis (Streptococcussdiacetilactis) and RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcuslactissubsp.cremoris). SBT0495K (starter culture for polysaccharide production type soft type cheese heads which mixed the polysaccharide production lactic-acid-bacteria stock in the starter culture of H) : Streptococcus Clemeau Rith (Streptococcuscremoris), RAKUTOKOKKASU KAZEI (Lactococcuscasei) And RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcuslactissubsp.cremoris) SBT0495L (a polysaccharide production lactic-acid-bacteria stock in the starter culture of I.) The mixed starter culture for polysaccharide production type soft type cheese heads : Streptococcus Clemeau Rith (Streptococcuscremoris), Leuconostoc SHITOROBORAMU (Leuconostoccitrovorum) and RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcuslactissubsp.cremoris) SBT0495 [0025]

## [Table 2]

	Starter culture Acidity (%) pH.	A 0.87 4.59B 0.89
4.60, C 0.80 4.53D 0.95 4.63E 1.04 4.70F 0.92 4.65G 0.85 4.61H 0.88 4.65I 0.92 4.71J 0.90 4.61K 0.92 4.66L 0.97 4.74. –		

[0026] Although the acidity and pH of the starter culture after fixed time culture changed by mixing a phosphorylated polysaccharide production lactic-acid-bacteria stock, It is a range controllable by changing culture time, and it was judged that six kinds of starter cultures containing the newly prepared phosphorylated polysaccharide production lactic-acid-bacteria stock had sufficient vital force. [0027]

[The example 5 of an examination] 12 kinds of starter cultures with which the vital force examination was presented were used, and yogurt was made as an experiment in accordance with the method indicated for the example 1 of an examination. Fermentation temperature shall be 20 \*\* desirable for production of a phosphorylated polysaccharide, and you made it ferment rather than usual for a long time, in using the starter culture D, E, and F which mixed the polysaccharide production strain, J, K, and L until acidity amounted to 0.80. And about six kinds of yogurt made as an experiment using the polysaccharide production type starter culture, the phosphorylated polysaccharide content in trial production yogurt was measured. The viscosity of a whey separation examination and appearance was measured about six kinds of yogurt made as an experiment using the starter culture for fermented milk. Measurement of phosphorylated polysaccharide content receives 1 l. of trial production yogurt, 100,000 units of pepsin and the sodium azide 0.2g of the protease were added, it heated for 30 minutes at 100 \*\* after decomposing the quality of the lactoprotein by carrying out 20 time processings at 37 \*\*, and the enzyme was deactivated. This nature decomposition product of the lactoprotein is cooled to

4 \*\*, and it is a hollow fiber type ultrafiltration equipment (cut-off-molecular-weight 3,000). Dilution by concentration and distilled water was repeated and ingredients other than polysaccharide were removed. And equivalent weight of ethanol was added to the collected concentrate, polysaccharide was collected as precipitation, and it was considered that the total amount of sugar was the content of a phosphorylated polysaccharide. The result is shown in Table 3.

[0028]

[Table 3]

. Starter culture Polysaccharide content (mg/l).

D 192.0E121.1F158.8J189.6K165.5L104.2. In the yogurt made as an experiment using the polysaccharide production type starter culture containing a ————— phosphorylated polysaccharide production lactic-acid-bacteria stock, all contained the 100–200mg/l. phosphorylated polysaccharide.

[0029] About measurement of the viscosity of a whey separation examination and appearance, it carried out in accordance with the method mentioned above. The result is shown in drawing 3. Although the viscosity of the yogurt made as an experiment using the starter culture used for the usual yogurt manufacture was 5–15mPa.s. The viscosity of the yogurt made as an experiment using the polysaccharide production type starter culture containing a phosphorylated polysaccharide production lactic-acid-bacteria stock was 200–500mPa.s. Although whey separation of the yogurt made as an experiment using the starter culture used for the usual yogurt manufacture was 40 to 60%. Each whey separation of the yogurt made as an experiment using the polysaccharide production type starter culture containing a phosphorylated polysaccharide production lactic-acid-bacteria stock was 15% or less. Therefore, it was judged that the quantity of the phosphorylated polysaccharide produced by a phosphorylated polysaccharide production lactic-acid-bacteria stock by this fermentation condition was sufficient quantity to demonstrate that characteristic as stabilizer of yogurt. In the example of an examination, although the culture temperature of lactic acid bacteria was 20 \*\*, in order to produce a phosphorylated polysaccharide efficiently, it is preferred to cultivate lactic acid bacteria in a temperature requirement (15 \*\* – 25 \*\*).

[0030] The phosphorylated polysaccharide of this invention was investigated about the availability of the stabilizer made into an active principle about the substitution effect of the fused salt used for manufacture of process cheese.

[0031]

[The example 6 of an examination] It is fused salt to natural cheese. (condensed phosphate) The phosphorylated polysaccharide was added by different concentration and process cheese was made as an experiment. The Gouda type cheese head and the Cheddar type cheese head which measured the moisture content beforehand were cut into the block like shape of about 1 cm, and after mixing at about 7:3 rate, water was blended so that the whole moisture might be 40%. After blending fused salt and/or a phosphorylated polysaccharide, it kneaded powerfully for 20 minutes in the glassware maintained in temperature of 80 \*\*. After this fusion process was completed, moved 10 ml of that liquefied cheese head to the centrifugal tube promptly, and centrifuged for 30 minutes by 60 \*\* and 10,000xg, fat separation was made to cause compulsorily, and the volume of the separated fat was measured. The result is shown in drawing 4. even when the addition of the fused salt added to natural cheese is reduced in the minute of the addition of the conventional fused salt half [ about ], by adding about 0.45% of the weight by making a phosphorylated polysaccharide into stabilizer shows that fat separation of process cheese can be controlled. Thus, by using as stabilizer the phosphorylated polysaccharide which the lactic acid bacteria of this invention produce shows that whey separation of a fermented dairy product can be prevented and mouthfeel, such as mouth-melt and smoothness, can be raised. It turns out that it can substitute for some condensed phosphate used as fused salt when manufacturing process cheese.

[0032] As a phosphorylated polysaccharide which can be used as an active principle of stabilizer of this invention, Streptococcus Lactis (Streptococcus lactis) or RAKUTOKOKKASU RAKUCHISU (Lactococcus lactis), Phosphorylated polysaccharide [JP,3-229702,A] which some strains of lactic acid micrococci, such as streptococcus Clemeau Rith (Streptococcus cremoris) or RAKUTOKOKKASU Clemeau Rith (Lactococcus cremoris), produce, Nakajima et al. and Carbohydr. Phosphorylated polysaccharide [WO 94/No. 12656 gazette] etc. which some strains of lactobacilli, such as Res., vol.224, pp.245–253–1992], and the Lactobacillus salmon (Lactobacillus sake), produce can be illustrated. As a lactic-acid-bacteria stock which produces the phosphorylated polysaccharide mixed in the starter culture of a fermented dairy product, Streptococcus Lactis (Streptococcus lactis) SBT 1209 (FERM P-8308) and streptococcus Clemeau Rith (Streptococcus cremoris) SBT. 0495 (FERM P-10053) etc. -- lactic-acid-bacteria stock [JP,3-229702,A] can be illustrated.

[0033] Next, an example is shown and this invention is explained in detail.

[Work example 1] Otto et al. According to the statement of [FEMS Microbiol. Lett., vol.16, pp.69-74, and 1990], 4 l. of total synthesis culture media were prepared. Filtration sterilization of this culture medium was carried out, and 5 liter-capacity jar fermenter (Applikon) performed constant pH culture which maintains pH to 6.3 with automatic titration of 3N potassium hydrate. After cultivating RAKUTOKOKKASU RAKUCHISU subspecies Clemeau Rith (Lactococcus lactis ssp. cremoris) SBT 0495 (FERM P-10053) as phosphorylated polysaccharide production lactic acid bacteria for about 55 hours, Abbreviation 4.7-l. culture medium was collected. This culture medium is centrifuged. (for 20,000xg and 60 minutes) Supernatant liquid abbreviation obtained by carrying out and removing a biomass thoroughly Equivalent weight of ethanol was mixed to 4.5 l., and the phosphorylated polysaccharide was settled. After carrying out settling centrifugal separation (for 4,000xg and 10 minutes), collecting them and fully dissolving with 500 ml of pure water, it is ethanol again. Operation of settling a phosphorylated polysaccharide by 500 ml was repeated twice, and phosphorylated polysaccharide partially purified substance was obtained. The dry weight of this phosphorylated polysaccharide partially purified substance is about 3.8g, and that sugar content and phosphoric acid content are about 65.5% and abbreviation, respectively. It was 7.8%. Enzyme pronase (Boehringer) decomposes protein for this part, As a result of ethanol precipitation's re-recovering refining phosphorylated polysaccharides, preparing a dry matter and calculating the purity of a phosphorylated polysaccharide from the weight before protein decomposition treatment, and the weight after processing, the purity of phosphorylated polysaccharide partially purified substance was about 72%. This phosphorylated polysaccharide partially purified substance was made into the active principle of stabilizer of this invention.

#### [0034]

[Work example 2] It added 0.3% of the weight by making into stabilizer the phosphorylated polysaccharide obtained in Example 1 after the end of a fermentation process of the agitated type yogurt made as an experiment in accordance with the conventional method, drink yogurt, sour cream, and frozen yogurt. On the other hand, a prototype was built also about the stabilizer additive-free contrast article, and a whey separation examination and organoleptics of each prototype were done. The whey separation examination was done by the method into which whey is made to divide compulsorily by centrifugal separation, and after thawing at the room temperature about frozen yogurt, it examined. Organoleptics were evaluated by ten panelists about smoothness and over the throat in four steps. The result is shown in Table 4. In the prototype which added the phosphorylated polysaccharide as stabilizer, whey separation has been improved about 20 to 40%, and smoothness and mouthfeel called over a throat have also been improved. Also in which prototype, it hardly changes to a contrast article in respect of flavor.

#### [0035]

[Table 4]

各種液状発酵乳製品の評価

製 品	ホエー分離*	官能評価**	
		滑らかさ	喉ごし
搅拌型ヨーグルト	38.5	△	○
搅拌型ヨーグルト(添加)	7.9	○	○
ドリンクヨーグルト	66.2	×	○
ドリンクヨーグルト(添加)	22.8	◎	◎
サワークリーム	28.3	○	○
サワークリーム(添加)	9.0	○	○
フローズンヨーグルト	43.5	△	△
フローズンヨーグルト(添加)	20.1	◎	◎

\* フローズンヨーグルトの場合は、室温で解凍してから測定を行った。

\*\*良好：◎ やや良：○ ふつう：△ 不良：×

#### [0036]

[Work example 3] Agitated type yogurt, solidified type yogurt, drink yogurt, and frozen yogurt were made as an experiment using the starter culture for fermented milk used in the example 4 of an examination, and the example 5 of an examination. About the starter culture which mixed the phosphorylated polysaccharide production lactic-acid-bacteria stock, fermentation temperature was 20 \*\*, and the usual manufacturing method was followed except making it ferment rather than usual for a long time until acidity amounted to 0.80. And a whey separation examination and organoleptics of each prototype were done. The whey separation

examination was done by the method into which whey is made to divide compulsorily by centrifugal separation, and after thawing at the room temperature about frozen yogurt, it examined. Organoleptics were evaluated by ten panelists about smoothness and over the throat in four steps. The result is shown in Table 5.

[0037]

[Table 5]

各種液状発酵乳製品の評価

製 品	スター	ホエー分離*	官 能 評 値**	
			滑らかさ	喉ごし
搅拌型ヨーグルト	通常型A	35.1	△	○
搅拌型ヨーグルト	多糖類型D	10.2	◎	○
凝固型ヨーグルト	通常型A	46.0	△	○
凝固型ヨーグルト	多糖類型D	13.2	○	○
ドリンクヨーグルト	通常型B	68.7	×	○
ドリンクヨーグルト	多糖類型E	33.8	◎	○
フローズンヨーグルト	通常型C	38.5	△	△
フローズンヨーグルト	多糖類型F	24.1	◎	○

\* フローズンヨーグルトについては解凍後に測定を行った。

\*\*良好：◎ やや良：○ ふつう：△ 不良：×

[0038]

[Work example 4] Camembert cheese, cottage cheese, and cream cheese were made as an experiment in accordance with the conventional method using the starter culture for soft type cheese heads used in the example 4 of an examination, and the example 5 of an examination. And organoleptics estimated the texture of each prototype. About Camembert cheese, the sample which removed the layer part by mildew was prepared, and the coefficient of viscosity and the elastic modulus were measured using the rheometer. When using for cooking or a confectionery raw material about cottage cheese and cream cheese, the panelist estimated three items of smoothness, mouth-melt, and whey separation like Example 3 as the desirable characteristic in four steps. About a soluble examination, it is a cheese head to a 200-ml \*\* beaker. Weighing of the 10 g was carried out, 90 ml of 80 \*\* warm water was added to this, and a stirring bar 4 cm in length was put in, and it agitated for 2 minutes by 650 rpm/min, maintaining 80 \*\* with a magnetic stirrer with the heater for an experiment. Then, it quenched at 20 \*\* or less in ice water promptly, it filtered by the nylon mesh 150 which measured weight beforehand, and insoluble matters were collected. After draining on the paper wiper the whole nylon mesh, weighing was carried out, the rate of the cheese head which dissolved from the weight of the insoluble matter was computed, and it was considered as the soluble index.

[0039] About Camembert cheese, the result of a coefficient of viscosity and an elastic modulus, and organic-functions evaluation is shown in Table 6. When a polysaccharide production type starter culture was used so that it may see in Table 6, both the coefficient of viscosity and the elastic modulus increased, and improved in respect of smoothness, mouth-melt, etc. also in organic-functions evaluation.

[0040]

[Table 6]

試作カマベールチーズの評価

スター	粘性率 (g/cm/sec)	弾性率 (g/cm/sec <sup>2</sup> )	官能評価*		
			滑らかさ	口溶け	ホエー分離
通常型H	43	0.64	△	○	◎
多糖類型K	52	0.83	○	◎	◎

\* 良好：◎ やや良：○ ふつう：△ 不良：×

[0041] The result of solubility and organic-functions evaluation is shown in Table 7 about cottage cheese and cream cheese. When a polysaccharide production type starter culture was used so that it may see in Table 7, solubility improved and evaluation improved also in which point of smoothness, mouth-melt, and whey separation.

[0042]

[Table 7]

試作ソフトタイプチーズの評価

チーズ	スター	溶解性 (%)	官能評価*		
			滑らかさ	口溶け	ホエー分離
カッテージチーズ	通常型G	45.6	×	×	○
カッテージチーズ	通常型I	38.9	×	×	○
カッテージチーズ	多糖類型J	73.0	△	△	◎
カッテージチーズ	多糖類型L	64.1	△	△	◎
クリームチーズ	通常型G	61.1	○	○	○
クリームチーズ	通常型I	58.2	○	○	○
クリームチーズ	多糖類型J	85.1	◎	◎	◎
クリームチーズ	多糖類型L	73.8	◎	◎	◎

\* 良好:◎ やや良:○ ふつう:△ 不良:×

#### [0043]

[Work example 5] In accordance with the conventional method, process cheese was made as an experiment. That in which usual added condensed phosphate 3% of the weight as fused salt in the process of dissolving natural cheese, It is condensed phosphate as fused salt. Phosphorylated polysaccharide obtained in Example 1 as 1.5 % of the weight and stabilizer The thing added 0.4% of the weight, and fused salt and a stabilizer additive-free thing were made as an experiment. About the quality of the prototype, organoleptics estimated, and under the conditions of the temperature of 50 \*\*, and 70% of humidity, it saves for 24 hours, forcible degradation was carried out, and separation of a fat or moisture was inspected. The result is shown in Table 8. The organization of fused salt and stabilizer additive-free trial production process cheese breaks easily so that it may see in Table 8.

In separation of the fat by compulsive degradation, or moisture, it was not desirable.

The trial production process cheese which made the addition of fused salt the usual half and added the phosphorylated polysaccharide as stabilizer on the other hand was quality usually equivalent to elegance at the point of an organization or flavor again at the result of the forced life test.

#### [0044]

#### [Table 8]

試作プロセスチーズの評価

プロセスチーズの種類	官能評価		強制劣化試験	
	組織	風味	脂肪分離	水分分離
溶融塩3%添加 (標準品)	良好	良好	良好	良好
溶融塩無添加	碎け易い	普通	不良	不良
溶融塩1.5%+ リン酸化多糖類0.4%	良好	良好	良好	良好

[Translation done.]

DOCUMENT 1/1  
DOCUMENT NUMBER  
@: unavailable

1. JP,08-224060,A(1996)

JAPANESE [JP,08-224060,A]

CLAIMS DETAILED DESCRIPTION  
TECHNICAL FIELD PRIOR ART  
EFFECT OF THE INVENTION  
TECHNICAL PROBLEM MEANS  
DESCRIPTION OF DRAWINGS  
DRAWINGS

[Translation done.]

\* NOTICES \*

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The result of a whey separation examination of each trial production yogurt in the example 2 of an examination is shown.

[Drawing 2] The flow curve of each trial production yogurt in the example 3 of an examination is shown.

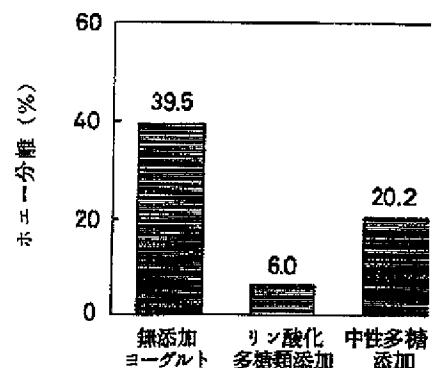
[Drawing 3] The result of measurement of the whey separation examination of each trial production yogurt in the example 5 of an examination and apparent viscosity is shown.

[Drawing 4] The result of fat separation of each trial production process cheese in the example 6 of an examination is shown.

[Translation done.]

Drawing selection

Drawing 1



[Translation done.]

BACK

NEXT

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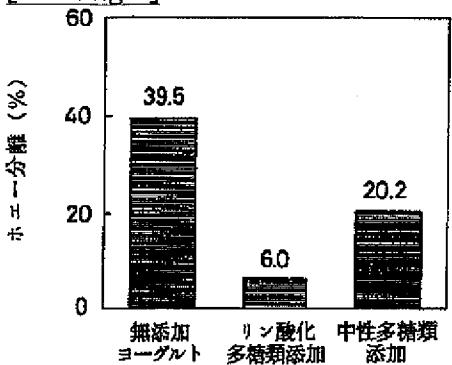
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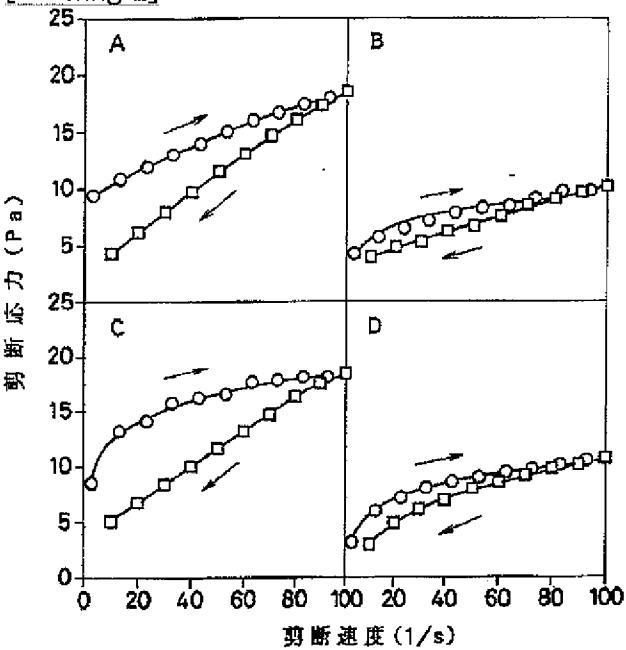
1. This document has been translated by computer. So the translation may not reflect the original precisely.
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**DRAWINGS**

[Drawing 1]

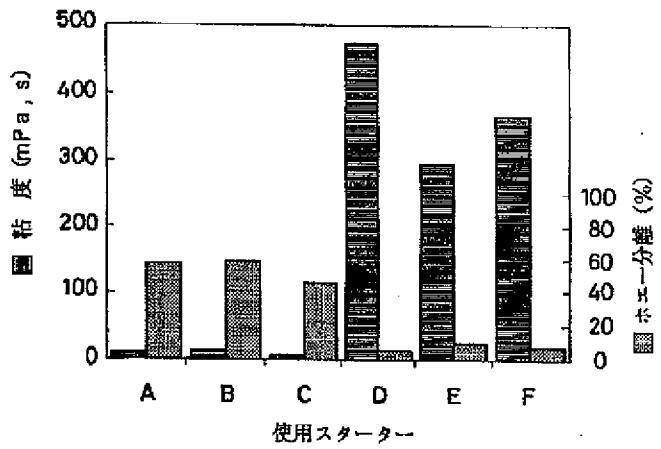


[Drawing 2]

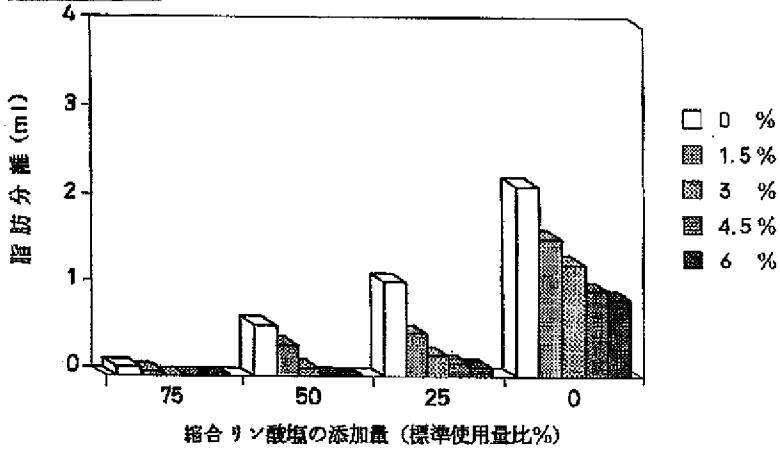


- A : リン酸化多糖類添加ヨーグルト(たんぱく質分解処理前)
- B : リン酸化多糖類添加ヨーグルト(たんぱく質分解処理後)
- C : 中性多糖類添加ヨーグルト(たんぱく質分解処理前)
- D : 中性多糖類添加ヨーグルト(たんぱく質分解処理後)

[Drawing 3]



[Drawing 4]



[Translation done.]